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An invited talk

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Publication date:
2011

Document Version
Early version, also known as pre-print

[Link to publication from Aalborg University](#)

Citation for published version (APA):

Hu, L. N., Zhang, C. Z., Yue, Y., & Mauro, J. C. (2011). *Fragile-to-strong transition in metallic glass-forming liquids: An invited talk*. Abstract from 5th International Workshop on Flow and Fracture of Advanced Glasses, St-Malo, France.

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Fragile-to-strong transition in metallic glass-forming liquids

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Abstract

Two of the earth's most abundant substances, water and silica, exhibit some of the most unusual properties in nature. Among these is an anomalous scaling of liquid dynamics, which appear non-Arrhenius (or “fragile”) at high temperatures yet Arrhenius (or “strong”) at low temperatures. Here we show that this fragile-to-strong (F-S) transition is not limited to a few liquids like water and silica, but is possibly a general behaviour of metallic glass-forming liquids (MGFLs). We also propose a general model for the viscosity of F-S liquids that captures the scaling of dynamics across both the fragile and strong regimes.